

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

MURGITROYD & COMPANY
Scotland House
165-169 Scotland Street
Glasgow
G5 8PL
GRANDE BRETAGNE

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(PCT Rule 71.1)

Date of mailing
(day/month/year)

02.07.2009

Applicant's or agent's file reference
P101097.WO.1

IMPORTANT NOTIFICATION

International application No.
PCT/GB2008/050210

International filing date (day/month/year)
21.03.2008

Priority date (day/month/year)
02.05.2007

Applicant
Pursuit Dynamics PLC.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international
preliminary examining authority:



European Patent Office Gitschiner Str. 103
D-10958 Berlin
Tel. +49 30 25901-0
Fax: +49 30 25901-840

Authorized Officer

Geier, Adolf

Tel. +49 30 25901-706




PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

| | | | |
|---|--|--|-----------------------|
| Applicant's or agent's file reference P101097.WO.1 | | FOR FURTHER ACTION | See Form PCT/IPEA/416 |
| International application No. PCT/GB2008/050210 | International filing date (day/month/year) 21.03.2008 | Priority date (day/month/year) 02.05.2007 | |
| International Patent Classification (IPC) or national classification and IPC INV. C12P19/14 | | | |
| Applicant Pursuit Dynamics PLC. | | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>9</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of <u>6</u> sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | |
| Date of submission of the demand 2009-03-02 | | Date of completion of this report 02.07.2009 | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840 | | Authorized officer Schröder, Gunnar Telephone No. +49 30 25901-326 | |



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2008/050210

Box No. I Basis of the report

1. With regard to the **language**, this report is based on

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of:
 - ☐ international search (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-18 as originally filed

Claims, Numbers

1-34 filed with the demand

Drawings, Sheets

1/3-3/3 as originally filed

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☒ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☒ the claims, Nos. 1-35
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

5. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 70.2 (e)).

6. ☐ Supplementary international search report(s) from Authority(ies) have been received and taken into account in drawing up this report (Rule 45bis.3(b) and (c)).

**INTERNATIONAL PRELIMINARY REPORT
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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|-------------|
| Novelty (N) | Yes: Claims | <u>1-34</u> |
| | No: Claims | |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | <u>1-34</u> |
| Industrial applicability (IA) | Yes: Claims | <u>1-34</u> |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: GB-A-1 028 211 (ESCHER WYSS GMBH) 4 May 1966 (1966-05-04)

D2: GB-A-995 660 (ESCHER WYSS GMBH) 23 June 1965 (1965-06-23)

1. Novelty

- 1.1 The subject-matter of claim 1 is considered to be new in the sense of Article 33(2) PCT.

The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (the references in parentheses applying to this document):

A process for the treatment of a starch-based feedstock (page 1, lines 8-20), comprising:

- A) mixing together starch-based feedstock and working fluid (water) to form a slurry;
- B) hydrating the starch-based feedstock with the working fluid;
- C) adding a liquefaction enzyme (alpha-amylase) to the slurry (page 3, lines 16-24);
- D) pumping the slurry into a passage of a starch activation device (vessel 4; page 3, lines 24-25); and
- E) injecting a high velocity transport fluid (pressurized steam) into the slurry, thereby further hydrating the starch-based feedstock and activating the starch content of the slurry (page 3, lines 25-29).

The document D2 is cited in D1 and is said to disclose the apparatus suitable for carrying out the above step E) of the process (see D1, page 1, lines 23-28).

Document D2 discloses:

An apparatus for injecting a high velocity transport fluid into a starch slurry through a nozzle communicating with the passage of a starch activation device (D2, page 2, lines 9-50 and claims 1-3).

The subject-matter of claim 1 therefore differs from this known process in that: said passage of a starch activation device has a "substantially constant diameter". In contrast, the passage in the process of document D1 is not further specified, but with the reference to the apparatus of document D2, it can be learned that the passage contains one or more constrictions (see document D2, page 2, lines 14-22 and figures 1-8).

The subject-matter of claim 1 is therefore new.

- 1.2 The subject-matter of claim 14 is considered to be new in the sense of Article 33(2) PCT.

The document D1 discloses (the references in parentheses applying to this document):

An apparatus for treating a starch-based feedstock, the apparatus comprising:
F) hydrating means for mixing and hydrating the feedstock with a working fluid to form a slurry (figure 1, tank 1; page 2, lines 7-11); and

G) a starch activation device in fluid communication with the hydrating means (figure 1, reaction vessel 4; page 2, lines 11-13),
wherein the starch activation device comprises:

H) a passage having an inlet in fluid communication with the hydrating means and an outlet (figure 1); and

I) a transport fluid nozzle communicating with the passage and adapted to inject high velocity transport fluid into the passage (figure 1, pipe 5 and page 2, lines 13-32; the nozzle being specified in D2, page 2, lines 35-37)

The subject-matter of claim 14 therefore differs from this known process in that: said passage of a starch activation device has a "substantially constant diameter".

The subject-matter of claim 14 is therefore new.

- 1.3 Claims 2-13 and 15-34 are dependent on claims 1 and 14, respectively, and as such also meet the requirements of the PCT with respect to novelty.

2. Inventive Step

- 2.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1 and 14 does not involve an inventive step in the sense of Article 33(3) PCT.

The process of document D1 (and the thereto related apparatus of document D2), which is considered to represent the most relevant state of the art, discloses a process and an apparatus from which the subject-matter of claims 1 and 14 differs in that the passage of the starch activation device has a "substantially constant diameter".

The technical effect issuing from this difference is not known from the application or from the available prior art documents. However, it can be speculated that a passage which, according to figure 2 of the application, has only a small diminution of the diameter (i.e. the intercept between the steam inlet and the outlet of the passage), causes less shearing forces to the slurry than a passage containing constrictions as shown on figures 1-8 of document D2. Also, such a process may be better suited to treat slurries which contain clumps or pieces of husk which may be present in the feedstock, and which otherwise may clog the passage at the constrictions of the passage of documents D1 and D2.

The problem to be solved by the present invention may therefore be regarded as to provide an alternative passage which is potentially more suitable for treating slurries containing clumps.

The solution proposed in claims 1 and 14 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The removal of the constrictions in the passage of the apparatus of document D2 corresponds to a slight constructional change, which comes within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Namely, if the skilled person were confronted with the problem that, when using specific raw materials, the passage in the apparatus of document D2 would tend to become clogged due to clumps or pieces of husk becoming entrapped at the constrictions, the

straightforward solution would obviously be to widen these constrictions. Such a widening of the constrictions would correspond to a passage having a substantially constant diameter.

Consequently, the subject-matter of claims 1 and 14 lacks an inventive step.

- 2.2 Dependent claims 2-13 and 15-34 do not seem to contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, see documents D1 and D2 and the corresponding passages cited in the search report.

The features of claim 2 are assumed to be the result of the high velocity steam being injected through nozzles into the stream of the pulp in the passage, in a diagonal, co-current angle, as it can be seen in figure 2 of the application. This design of the steam injector is however known from D2, see e.g. figures 2, 3 and 5-8. It is therefore assumed that this known steam injection device leads to the same effects as described in claim 2, namely the application of a shear force, atomisation, formation of low and high pressure regions and a condensation shock wave.

The features of claims 4, 5 and 15 are found in D1, page 2, lines 33-43 and page 3, lines 29-35, the option of heating/cooling any of the reactors being evident from claim 9. The features of claim 10 are found in D2, page 2, lines 35-37 and figures 1-8. Claim 11 is anticipated by example 1 of D1, where only a single pass is performed, while the subject-matter of claims 12 and 33 is evident from D2, page 2, lines 93-106 and claim 11 of D2.

The features of claims 16, 19 and 21 can be directly derived from the scheme of figure 1 of D1 (second vessel = 6¹ or 6²) and figures 1-8 of D2. The feature of claim 23 is found in D2, page 3, lines 34-36. Claim 25 is an obvious and implicit feature of the above process using a steam injector. The feature of claim 26 is suggested in D2, figure 2 and page 2, lines 127-page 3, line 9. The features of claims 29-31 are found in D2, figures 5 -8 and page 3, lines 82-page 4, line 66 and claims 12-23 of D2.

Other features, such as the features of claims 3, 6, 8, 13, 17, 18, 20, 22, 24, 27-28, 32 and 34 seem to be slight constructional changes / specifications which

come within the scope of the customary practice followed by persons skilled in the art, especially as the advantages thus achieved can readily be foreseen. Consequently, the subject-matter of these claims lacks an inventive step.

3. Clarity and Support

- 3.1 The application does not meet the requirements of Article 6 PCT, because claim 1 is not clear. The word "substantially" is only a vague definition and no clear cut limits are set with the expression "substantially constant diameter". One could easily argue that in the example given in the application, in figure 2, the passage depicted in the figure is *not* substantially constant. Since this feature is the only distinguishing feature versus the process and apparatus of the closest prior art, it is important that the feature clearly differentiates the process or apparatus of the application from the known process or apparatus.
- 3.2 Independently of the above, claim 1 is not supported by the description as required by Article 6 PCT, as its scope is broader than justified by the description. Claim 1 describes a process, in which a "working fluid", a "starch activation device" and a "transport fluid" are utilized. The claimed subject-matter encompasses *any* fluids and *any* device, whereas support within the meaning of Article 6 PCT and disclosure within the meaning of Article 5 PCT has been given only for water as the working fluid and steam as the transport fluid, and the starch activation device consists of a reactor equipped with a steam injector having specific features. It is not obvious what other fluids or devices could be suitable for the claimed process. Thus, said claim is not supported and disclosed over its whole breadth.
- 3.3 In claim 2 an attempt is made to define the method by reference to a result to be achieved. Article 6 in conjunction with Rule 6.3 (a) requires that all the essential features of the claimed invention have to be indicated in the claim in technical terms. Claims which attempt to define the invention by a result to be achieved should not be allowed, in particular if they only amount to claiming the underlying technical problem. The description (page 10, line 12- page 11, line 24) conveys the impression that the effects described in claim 2 can only be achieved when a high pressure (5-7 bar) steam is used at supersonic velocity.

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- 3.4 The features of claims 3, 4 and 5, "heating the slurry" and/or maintaining it "at a predetermined temperature", are vague and unclear and leave the reader in doubt as to the range of temperatures to which they refer, thereby rendering the definition of the subject-matter of said claim unclear, Article 6 PCT.
- 3.5 The features of the apparatus claims 14-35 are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

CLAIMS:

1. A process for the treatment of a starch-based feedstock,
comprising:
 - 5 mixing together starch-based feedstock and working fluid to form a slurry;
hydrating the starch-based feedstock with the working fluid;
adding a liquefaction enzyme to the slurry;
pumping the slurry into a substantially constant diameter passage
10 of a starch activation device; and
injecting a high velocity transport fluid into the slurry through a nozzle communicating with the passage, thereby further hydrating the starch-based feedstock and activating the starch content of the slurry.
- 15 2. The process of Claim 1, wherein the step of injecting the transport fluid into the slurry comprises:
 - applying a shear force to the slurry;
atomising the liquid phase within the slurry to create a dispersed
droplet flow regime;
20 forming a low pressure region downstream of the nozzle; and
generating a condensation shock wave within the passage downstream of the nozzle by condensation of the transport fluid.
- 25 3. The process of either preceding claim, wherein the hydrating step includes heating the slurry and/or maintaining it at a first predetermined temperature within a first vessel for a first predetermined period of time.
4. The process of Claim 3 further comprising the step of transferring the slurry to a second vessel from the starch activation device, and

maintaining the temperature of the slurry in the second vessel for a second predetermined period of time.

5 5. The process of Claim 4, wherein the step of transferring the slurry to the second vessel includes passing the slurry through a temperature conditioning unit to raise the temperature of the slurry.

10 6. The process of Claim 4 or Claim 5 further comprising the step of agitating the slurry in the first and second vessels for the respective first and second periods of time.

7. The process of any preceding claim, wherein the transport fluid is steam.

15 8. The process of any preceding claim, wherein the transport fluid is injected at a supersonic velocity.

20 9. The process of any preceding claim, wherein the working fluid is water.

10. The process of any preceding claim, wherein the step of injecting the transport fluid comprises injecting the high velocity transport fluid into the slurry through a plurality of nozzles communicating with the passage.

25 11. The process of any preceding claim, wherein the step of injecting the transport fluid into the slurry occurs on a single pass of the slurry through the starch activation device.

12. The process of any of Claims 1 to 10, wherein the step of injecting the transport fluid includes recirculating the slurry through the starch activation device.
- 5 13. The process of any preceding claim, wherein the pumping of the slurry is carried out using a low shear pump.
14. An apparatus for treating a starch-based feedstock, the apparatus comprising:
- 10 hydrating means for mixing and hydrating the feedstock with a working fluid to form a slurry; and
a starch activation device in fluid communication with the hydrating means;
wherein the starch activation device comprises:
- 15 a passage of substantially constant diameter having an inlet in fluid communication with the hydrating means and an outlet; and
a transport fluid nozzle communicating with the passage and adapted to inject high velocity transport fluid into the passage.
- 20 15. The apparatus of Claim 14, wherein the hydrating means comprises a heating means for heating the working fluid and/or the slurry.
16. The apparatus of Claim 15, wherein the hydrating means comprises a first vessel having an outlet in fluid communication with the inlet of the
- 25 passage.
17. The apparatus of Claim 16, wherein the heating means comprises a heated water jacket surrounding the first vessel.

18. The apparatus of either Claim 15 or Claim 16, wherein the heating means is remote from the hydrating means.

5 19. The apparatus of Claim 16 further comprising a second vessel having an inlet in fluid communication with the outlet of the passage.

20. The apparatus of Claim 19, wherein the second vessel includes insulating means for insulating the contents of the second vessel.

10 21. The apparatus of any of Claims 14 to 18 further comprising a residence tube section having an inlet in fluid communication with the outlet of the passage.

15 22. The apparatus of Claim 21, wherein the residence tube includes insulating means for insulating the contents of the residence tube as it passes through.

20 23. The apparatus of any of Claims 14 to 22, wherein the transport fluid nozzle is annular and circumscribes the passage.

24. The apparatus of any of Claims 14 to 23, wherein the transport fluid nozzle has an inlet, an outlet and a throat portion intermediate the inlet and the outlet, wherein the throat portion has a cross sectional area which is less than that of the inlet and the outlet.

25 25. The apparatus of any of Claims 14 to 24 further comprising a transport fluid supply adapted to supply transport fluid to the transport fluid nozzle.

26. The apparatus of Claim 25 comprising a plurality of starch activation devices in series and/or parallel with one another, wherein the transport fluid supply is adapted to supply transport fluid to the transport fluid nozzle of each device.

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27. The apparatus of Claim 26 comprising a plurality of transport fluid supply lines connecting the transport fluid supply with each nozzle, wherein each transport fluid supply line includes a transport fluid conditioning means.

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28. The apparatus of Claim 27, wherein the transport fluid conditioning means is adapted to vary the supply pressure of the transport fluid to its respective nozzle.

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29. The apparatus of Claim 25 comprising a dedicated transport fluid supply for each transport fluid nozzle.

30. The apparatus of Claim 29, wherein each transport fluid supply includes a transport fluid conditioning means.

20

31. The apparatus of Claim 30, wherein each conditioning means is adapted to vary the supply pressure of the transport fluid to each respective nozzle.

25

32. The apparatus of any of Claims 14 to 31 further comprising a temperature conditioning unit located downstream of the starch activation device, the temperature conditioning unit adapted to increase the temperature of fluid leaving the passage of the device.

33. The apparatus of any of Claims 14 to 32 further comprising a recirculation pipe adapted to allow fluid recirculation from downstream of the starch activation device to upstream of the starch activation device.
- 5 34. The apparatus of any of Claims 14 to 33 further comprising a low shear pump adapted to pump fluid from the hydrating means to the starch activation device.